INSERTABLE ENDOSCOPIC INSTRUMENT FOR TISSUE REMOVAL

RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. application Ser. No. 14/280,202, entitled "Insertable Endoscopic Instrument for Tissue Removal," filed on May 16, 2014, which claims the benefit of and priority to U.S. Provisional Patent Application 61/824,760, entitled "Insertable Endoscopic Instrument for Tissue Removal," filed on May 17, 2013 and to U.S. patent application Ser. No. 13/336,491, entitled "Endoscopic Tool For Debriding and Removing Polyps," filed on Dec. 23, 2011, which claims the benefit of and priority to U.S. Provisional Patent Application 61/566,472, entitled "Endoscopic Tool For Debriding and Removing Polyps," filed on Dec. 2, 2011, each of which is incorporated herein by reference in its entirety for all purposes.

BACKGROUND OF THE INVENTION

Colon cancer is the third leading cause of cancer in the United States but is the second leading cause of cancer-related deaths. Colon cancer arises from pre-existing colon polyps (adenomas) that occur in as many as 35% of the US population. Colon polyps can either be benign, precancerous or cancerous. Colonoscopy is widely regarded as an excellent screening tool for colon cancer that is increasing in incidence worldwide. According to the literature, a 1% increase in colonoscopy screening results in a 3% decrease in the incidence of colon cancer. The current demand for colonoscopy exceeds the ability of the medical system to provide adequate screening. Despite the increase in colon cancer screening the past few decades, only 55% of the eligible population is screened, falling far short of the recommended 80%, leaving millions of patients at risk.

Due to the lack of adequate resources, operators performing a colonoscopy typically only sample the largest polyps, exposing the patient to sample bias by typically leaving behind smaller less detectable polyps that could advance to colon cancer prior to future colonoscopy. Because of the sample bias, a negative result from the sampled polyps does not ensure the patient is truly cancer-free. Existing polyps removal techniques lack precision are cumbersome and time consuming.

At present, colon polyps are removed using a snare that is introduced into the patient's body via a working channel defined within an endoscope. The tip of the snare is passed around the stalk of the polyp to cut the polyp from the colon wall. Once the cut has been made, the cut polyp lies on the intestinal wall of the patient until it is retrieved by the operator as a sample. To retrieve the sample, the snare is first removed from the endoscope and a biopsy forceps or suction is fed through the same channel of the endoscope to retrieve the sample.

Accordingly, there is a need for an improved endoscopic instrument that increases the precision and speed of polyp removal for biopsy.

SUMMARY OF THE INVENTION

An improved endoscopic instrument is provided that can precisely remove sessile polyps and efficiently obtain samples of multiple polyps from a patient. In particular, the improved endoscopic instrument is capable of debriding one or more polyps and retrieving the debrided polyps without having to alternate between using a separate cutting tool and a separate sample retrieving tool. The sampling can be integrated with colonoscopy inspection. In some implementations, the endoscopic instrument can cut and remove tissue from within a patient. In some such implementations, the endoscopic instrument can cut and remove tissue substantially simultaneously from within a patient accessed through a flexible endoscope.

In one aspect, an endoscopic instrument insertable within a single instrument channel of an endoscope includes a power-driven instrument head configured to resect material at a site within a subject having been reached by a flexible endoscope with working channel. The power-driven instrument head has a first distal end and a first proximal end. The first distal end of the power-driven instrument head defines a material entry port through which the resected material can enter the flexible endoscopic instrument. A body is coupled to the first proximal end of the power-driven instrument head and configured to drive the power-driven instrument head. The body includes a flexible portion that has a second distal end and a second proximal end. The second proximal end of the flexible portion defines a material exit port. An aspiration channel extends from the material entry port of the power-driven instrument head to the material exit port of the flexible portion. The second proximal end of the flexible portion is configured to couple to a vacuum source such that the resected material entering the aspiration channel via the material entry port is removed from the aspiration channel at the material exit port while the endoscopic instrument is disposed within an instrument channel of a flexible endoscope.

In some implementations, the body further includes a powered actuator. The powered actuator is coupled to the first proximal end of the power-driven instrument head and configured to drive the power-driven instrument head. In some implementations, the powered actuator is one of a hydraulically powered actuator, a pneumatically powered actuator or an electrically powered actuator. In some implementations, the powered actuator includes at least one of an electric motor, a tesla rotor, and a vane rotor. In some implementations, the endoscopic instrument includes an energy storage component configured to power the powered actuator. In some implementations, the aspiration channel is defined by the power-driven instrument head, the powered actuator and the flexible portion.

In some implementations, the powered actuator is one of a hydraulically powered actuator or a pneumatically powered actuator. In some such implementations, the flexible portion includes a fluid inlet tubular member configured to supply irrigation to actuate the power actuator and a fluid outlet tubular member configured to remove the fluid being supplied to actuate the actuator. In some implementations, the flexible portion includes an aspiration tubular member that defines a proximal portion of the aspiration channel.

In some implementations, the powered actuator includes a hollow portion, the hollow portion fluidly coupling the material entry port of the power-driven instrument head and the material exit port of the flexible portion.

In some implementations, the instrument includes an engagement assembly configured to contact the walls of the instrument channel of the endoscope when actuated. In some implementations, the engagement assembly includes a compliant ring structure configured to be deformed.

In some implementations, the power-driven instrument head includes an outer structure and a cutting shaft disposed within the outer structure, the cutting shaft coupled to the powered actuator and configured to rotate relative to the outer